



LuOcean Driver Kit & Chiller Unit

Factsheet

The LuOcean™ Driver Kit caters to the needs of OEM manufacturers seeking swift commissioning of laser modules for testing and development. It offers a digital interface to connect with LuOcean™ diode lasers.

The Driver Kit comprises a controller that reads laser module signals and controls pilot laser parameters. It also includes laser drivers for activating the laser module. Additionally, the kit provides the option to add up to two chiller drivers, particularly useful for the Mini4 and Mini8 laser modules, which can be equipped with a LuOcean™ Chiller Unit.

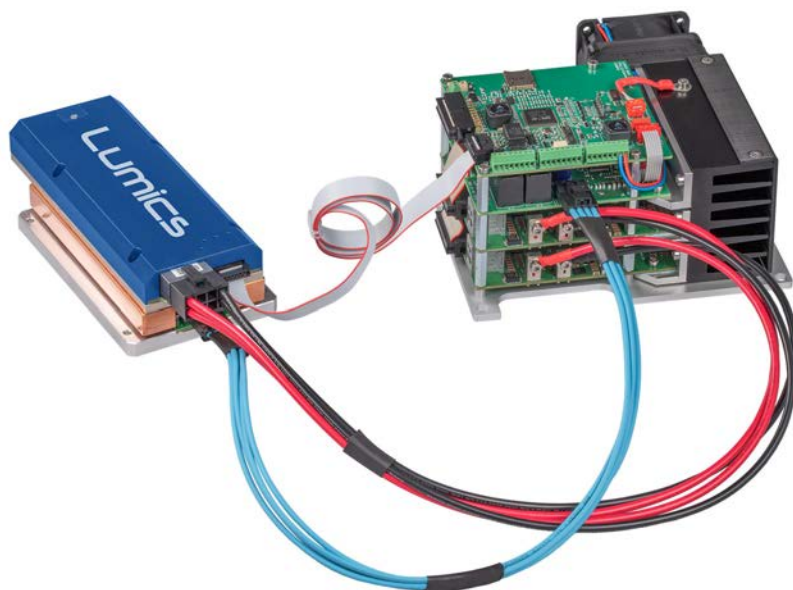
Simplifying development and manufacturing is a priority, achieved through the inclusion of a standard RS232 programming interface and built-in protection functions. These features streamline operations and enhance equipment safety.

FEATURES & FUNCTIONS

- Full digital control using RS232 interface
- Current range 0.3 to 28 A
- Pilot on/off & intensity control
- Pulse mode (Minimum pulse width 100 μ s)
- Duty cycle range 1% to 99%
- Temperature control accuracy $\pm 2^{\circ}\text{C}$
- Laser shut down after error / interlock
- External analog synchronization
- Shut down in case of overheating
- Fan & heat sink for Driver Kit (only small quantities)
- Interface cable to LuOcean diode lasers

OPTIONS & ACCESSORIES

- Chiller Driver (with cables)
- Chiller Unit for Mini4 and Mini8



Lumics

We manufacture diode lasers.

Characteristics of the Driver Kit Components

Parameter	Symbol	Min	Typical	Max	Unit
Characteristics Diode Laser Driver					
Output current on laser terminal in pulsed and CW mode	I _{out}	0.3		28	A
Efficiency	h		96		%
Output Current Ripple (10 - 600) kHz at ≥1A	I _{rms}		0.1		A
Output Current Ripple (10 - 600) kHz below 1A	I _{rms}		0.2		A
Rise and Fall Time full current range (1)	t _{rise}		0.03	0.15	ms
Current Overshoot (2) at ≥1A and output voltage ≥10% input voltage	I _{err}			10	%
Current Overshoot (2) at ≥1A and output voltage (>7% and <10%) input voltage	I _{err}		10	20	%
Current Overshoot (2) below 1A	I _{err}		20		%
Current Accuracy (dc to 5 kHz) (3) at ≥1A	I _{acc_1}			±2	%
Current Accuracy (dc to 5 kHz) (3) below 1A	I _{acc_2}		±5		%
Pulse width single current driver	P _w	100			µs
Minimum pulse phase delay between two synchronized pulses	P _w	100			µs
Pulse duty cycle	P _{dc}	1			%
Input voltage on DC supply terminal for the 48V laser driver	V _{in}		48		V
Output voltage on laser terminal for the 48V laser driver	V _{out}	3.5		40	V
Input voltage on DC supply terminal for the 24V laser driver	V _{in}		24		V
Output voltage on laser terminal for the 24V laser driver	V _{out}	2		20	V
Input voltage on DC supply terminal for the 12V laser driver	V _{in}		12		V
Output voltage on laser terminal for the 12V laser driver (4)	V _{out}	1		7	V
Characteristics Controller					
Supply Voltage / Current without fan		12 / <0.8		48 / <0.2	V/A
Single shot and pulse train with up to 1000 pulses			yes		
Current read back, sample rate			2		ms
Voltage read back, sample rate			2		ms
Maximum phase shift per number of synchronized pulses			20		µs
Maximum phase jitter between synchronized pulses			20		µs
RS232 Baud rate			9600 or 115200		
RS232 Data Format			8 Data Bit / no parity / 1 Stop Bit		
Fan voltage setting for optional heat sink with fan	V _{fan}		14 or 26		V
Fan current for optional heat sink with fan	I _{fan}			0.7	A
Interlock Signal	V _{interlock}	11	12	13	V
Laser shut down delay after external interlock signal	t _{d_delay}			200	µs
Characteristics Chiller Driver					
Input voltage on DC supply terminal	V _{in}	23.5	24	24.5	V
Output voltage on TEC terminal - minimum value is TEC dependent	V _{out}	TEC dep.		18	V
Input voltage on DC supply terminal	V _{in}	47.5	48	48.5	V
Output voltage on TEC terminal (required for Lumics Chiller Unit) - minimum value is TEC dependent	V _{out}	TEC dep.		40	V
CW output current on TEC terminal for whole output voltage range	I _{out}	1		14	A
CW output current ripple on TEC terminal for whole output voltage range	I _{ripple}			10	%
Thermistor terminal (NTC) on controller board				10	kOhm
Accuracy of the temperature regulation at constant thermal load	T _{accuracy}			±2	°C
Settling time of temperature at 100% thermal load change to T _{set}	T _{settling}		10	30	S
Operating Conditions (Driver Kit & Including Chiller Unit)					
Storage Temperature	T _s	-10		55	°C
Internal Operating and (Ambient) Temperature	T _{op}	0		45	°C
Humidity / Non-condensing Atmosphere				80	%

(1) Rise and Fall time increase with driving current.

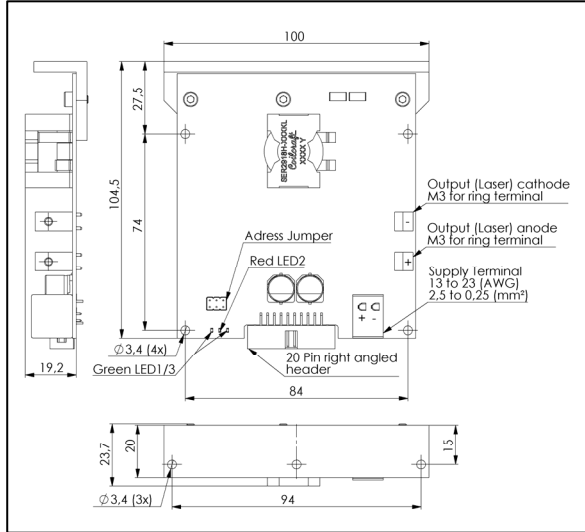
(2) Current overshoot is about max. 400µs and typical 200µs long and increases with lower driving voltage, lower duty cycle and lower pulse width.

(3) Accuracy depends on current.

(4) Lower driving voltage than 1.3V results in current overshoot of >20%. It is recommended to add Si-Schottky diodes in series with the laser diode to increase to driving voltage.

Drawings and Dimensions of Driver Kit Boards

Laser Driver Board

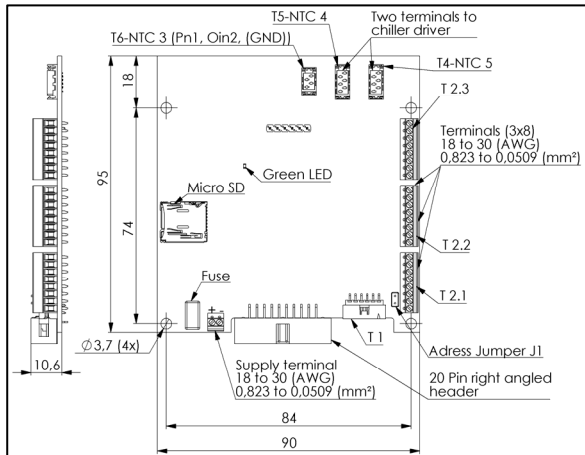


Pin	Term.	Sensor / Control Function Terminal
1	T2.1	RS232-TX signal - OUT
2	T2.1	RS232-RX signal - In
3	T2.1	GND RS232 (serial interface common, floating)
4	T2.1	Interlock signal - In
5	T2.1	Interlock supply - Out (12V or 24 V)
6	T2.1	no connection
7	T2.1	GND
8	T2.1	Interlock on - LED Out (3.3V)
1	T2.2	Laser driver 1 on - LED out (3.3V)
2	T2.2	Laser driver 2 on - LED out (3.3V)
3	T2.2	Laser driver 3 on - LED out (3.3V)
4	T2.2	Laser driver 4 on - LED out (3.3V)
5	T2.2	Laser driver 5 on - LED out (3.3V)
6	T2.2	Laser driver 6 on - LED out (3.3V)
7	T2.2	Laser diode monitor 1 (V) module dependent
8	T2.2	Laser diode monitor 2 (V) module dependent
1	T2.3	GND
2	T2.3	Pulse Sync In
3	T2.3	GND
4	T2.3	Pulse Sync Out
5	T2.3	GND
6	T2.3	no connection
7	T2.3	Fan (GND) laser driver
8	T2.3	Fan (+) laser driver

Notes:

- Cooling optional (heat sink and type (convection or forced air cooling) depends on thermal load. Total thermal resistance of build-in heat sink 10K/W
- To diode laser one 2 way M3 screw terminal block, type Würth electronic 7461101.
- To power supply one 2 way push in clamp terminal block for up to 2.5 sq.mm or 10 AWG, type Wago 2624-1102.
- Fuse 30A SMD , type Schurter 3403.0289.23.

Controller Board

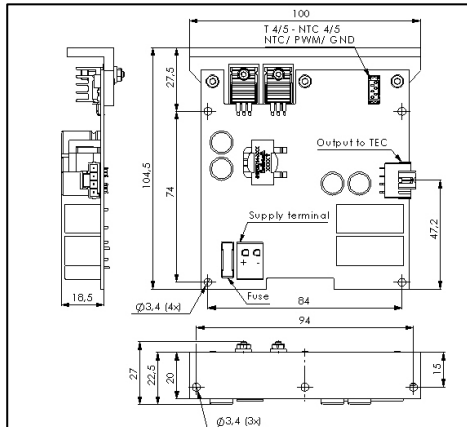


Pin	Term.	Sensor / Control Function Terminal
1	T1	Vs = 12 V for Fiber sensor / Monitor diode cathode
2	T1	Fiber sensor 1 signal - In
3	T1	GND
4	T1	Fiber sensor 2 signal - In
5	T1	Monitor diode signal 1 - In
6	T1	Pilot laser (3/5) V (50 mA) 8 V / 100 mA - Out
7	T1	Monitor diode signal 2 - In
8	T1	GND (Pilot) or humidity sensor or digital bus
9	T1	GND (NTC)
10	T1	Pilot intensity control (0-5)V, pilot off =5V
11	T1	NTC1 - In
12	T1	NTC2 - In or digital bus

Notes:

- Cooling convection cooling only
- Signal & control interface terminal 1 to laser module: a 12-pin double row flat cable socket
- Signal & control Interface terminal 2 to external devices: a 3x8 way screw terminal block
- Fuse in a box , type Little fuse 0154002Dr

Chiller Driver Board



Pin	Term.	Sensor / Control Function Terminal
1	T4/5	TEC supply (+/- depending on cool or heat mode)
2	T4/5	GND
3	T4/5	NTC of Chiller Unit
4	T4/5	TEC supply (+/- depending on cool or heat mode)
1	T2	PWM from controller board
2	T2	Polarity of TEC supply from controller board
3	T2	Enable TEC supply from controller board
4	T2	NTC of Chiller Unit
5	T2	GND (NTC)
6	T2	VCC (3V)

Notes:

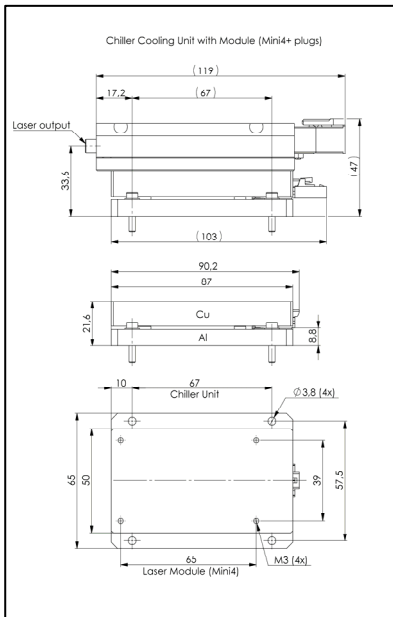
- Internal resistance ~1.4Ohm for Mini4 and ~2.8Ohm for Mini8.
- Terminal to Chiller Unit (or TEC): a 4-terminal block, Molex 172310-1104_1X4_3.5MM_90G RAD, Counterpart: Molex Mega-Fit Female Crimp 1722533011 and Molex Receptacle 172256-1104
- Terminal to power supply: a 2-way push in clamp terminal block for up to 2.5 sq.mm or 10 AWG, Wago 2624-1102
- Terminal to Driver Kit controller: TE connectivity terminal

Characteristics of the Chiller Unit

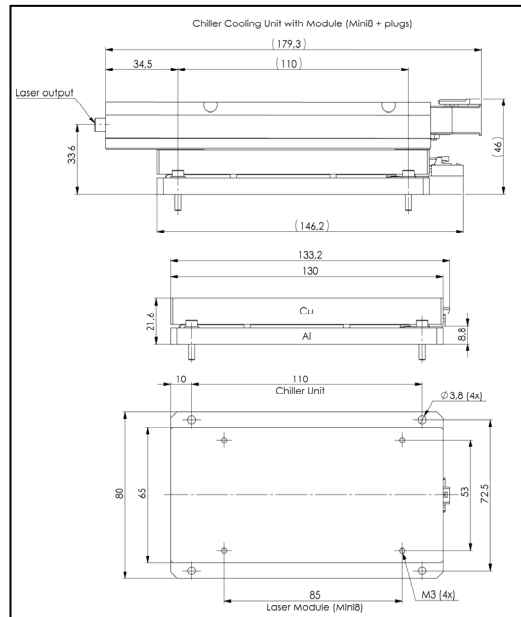
Parameter	Symbol	Min	Typical	Max	Unit
Chiller unit					
Cooling power for Mini4 Chiller Unit LU_CU_A_A	Pcooling			70	W
Cooling power for Mini4 Chiller Unit LU_CU_A_B	Pcooling			90	W
Cooling power for Mini8 Chiller Unit LU_CU_B_A	Pcooling			140	W
Cooling power for Mini8 Chiller Unit LU_CU_B_B	Pcooling			180	W
Supply current for Mini4 and Mini8 Chiller Unit	Isupply	1		14	A
Supply voltage for Mini4 Chiller Unit	Vsupply			24	V
Supply voltage for Mini8 Chiller Unit	Vsupply			48	V
Slope coefficient of efficiency (COP) of the Chiller Unit ($COP = COP_{lina} + COP_{linb} * \Delta T$)	COP_linb		-0.013		1/K
Offset coefficient of efficiency (COP) of the Chiller Unit ($COP = COP_{lina} + COP_{linb} * \Delta T$)	COP_lina		0.91		
Operating Conditions					
Storage Temperature	Ts	-10		55	°C
Internal Operating and (Ambient) Temperature, CW Operation	Top	0		45	°C
Humidity / Non-condensing Atmosphere				80	%

Drawings and Dimensions of the Chiller Unit

Chiller Unit for Mini4



Chiller Unit for Mini8



Notes:

- Design the electric voltage and current requirement of your thermoelectric coolers such that they fit to the available input voltage and current range
- Maximum number of chiller drivers is two.
- Chiller unit to chiller driver: one 4-pin terminal block, type Molex 172310-1104_1X4_3.5MM_90°
- Counterpart: Molex Mega-Fit Female Crimp Terminal part No 1722533011 and Molex Receptacle part no 172256-1104

The heat sink attached to the hot side of the Chiller Unit must provide a thermal resistance to dissipate the thermal load of the laser module. The proportional and integral part of the PI temperature regulation loop must be optimized. The heat load of the Chiller Unit to the heat sink is calculated from the temperature difference (ΔT) between the diode laser module side (cold side) and the heat sink side (hot side) as well as from the heat load of the diode laser with the following formula: Heat load of the Chiller Unit = heat load from the diode laser / COP.

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